PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :
B30B 9/30, A01F 15/00, 25/14

A1

(11) International Publication Number: WO 97/11840

(43) International Publication Date: 3 April 1997 (03.04.97)

(21) International Application Number: PCT/NL96/00372

(22) International Filing Date: 25 September 1996 (25.09.96)

(30) Priority Data:
1001306 28 September 1995 (28.09.95) NL

(71) Applicant: V.O.F. HANDELSONDERNEMING RUVO [NL/NL]; Venneperweg 363, NL-2153 AA Nieuw Vennep (NL).

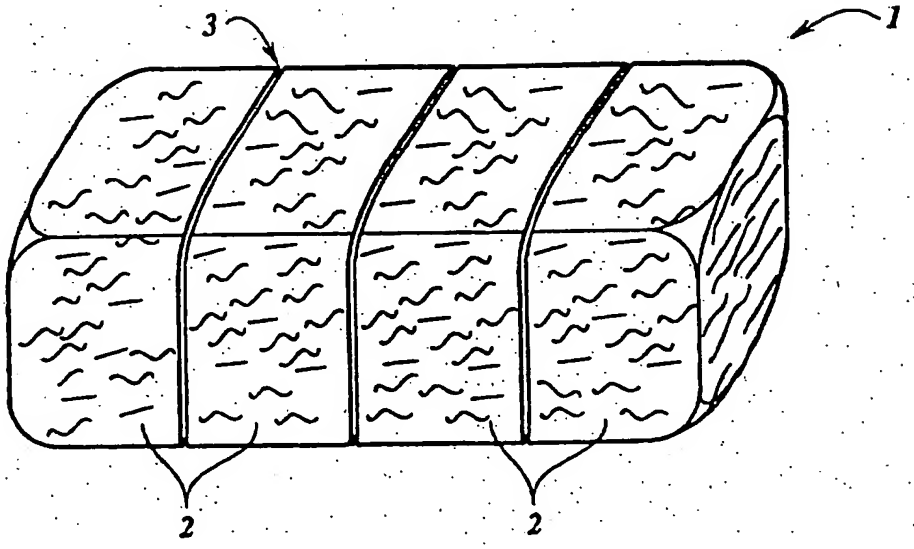
(72) Inventor: VOGELAAR, Pieter; Venneperweg 363, NL-2153 AA Nieuw Vennep (NL).

(74) Agent: METMAN, Karel, Johannes; Gebouw Autumn, Overschiestraat 184 N, NL-1062 XK Amsterdam (NL).

(81) Designated States: JP, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.
In English translation (filed in Dutch).

(54) Title: FEED AS WELL AS AN APPARATUS AND A METHOD FOR PRODUCING FEED



(57) Abstract

The invention relates to a feed for domestic animals, consisting of dried and compressed long fibre material such as hay and straw, packaged in a foil, wherein the fibres are compressed into a volume enclosed by the foil, said material being compressed to a density which is higher than 90 kg/m^3 and includes one or more cutting faces (3) inwardly of the foil. The invention also includes a method and apparatus for making such feed.

Feed as well as an apparatus and a method for producing feed

The invention relates to feed for domestic animals consisting among others of vegetable material such as hay and straw, dried and compressed and packaged by a wrapping into a bale.

Such feed is well-known, in which for example hay is compressed into a bale, having a weight of approximately 1 or 2.5 kg and a density of approximately 90 kg/m^3, wherein the hay is wrapped into a plastic foil with which the material is kept in compressed condition. These feeds are used for feeding domestic animals, such as rabbits, hamsters and the like, wherein a portion of the hay contained in het package is used each time.

Hay and straw packaged into bales by means of plastic foil and having a weight of 1.25 or 5 kg and a density of more than 90 kg/m^3 is well-known. Due to the high density, the fibre material has lost a great part of its resilience. These known bales also have the disadvantage that it is difficult to pull the fibres out of the package and therefore it is necessary to open the whole package and untangle the fibres before they are distributed as feed. Therefore, it is sometimes practised to first cut the fibres small, which is disadvantageous for the intended use.

It is an object of the present invention to remove the above mentioned disadvantages and for this purpose the bale includes several cutting faces perpendicular to the longitudinal direction, whereas the fibres are compressed parallel to the cutting faces.

As a result, it is achieved that it is possible to easily separate a portion of the fibres from the package since there are no fibres extending from one part of the package to the other as a result of the cutting face, and due to the compression parallel to the cutting face the cut-off portion remains its shape along this face and is a

fixed-shape part of the package created, which can easily be removed and used.

According to a improvement of the invention the wrapping is a closed plastic foil against which the fibres are resiliently expanded.

This results in a solid bale which is properly stackable and solid meaning a great advantage during transport and storage from manufacturer to user.

According to an embodiment of the invention the distance between the cutting faces is substantially 10 cm.

This results in a solid and easy to handle part of the bale which, upon loosening, provides sufficient material for example for a domestic animal.

According to a further improvement of the invention, the vegetable material is stripped of small broken and/or crushed fibre material and other pollutions.

Due to this feature it is prevented that during unpackaging the material pollutions such as dust exit, which could lead to pollution of the environment. In prior art bales these pollutions, mostly adhered to the wrapping, since gravity cause them to sack between the fibres to the outer edge of the material during compressing or packaging resulting in a release during opening of the package. By removing these pollutions before packaging, this discomfort is prevented.

In accordance with a further improvement the fibres are compressed to a density of more than 150 kg/m^3.

This makes it possible to transport and store more material in the same volume.

The invention also includes a method of packaging a feed for domestic animals consisting of dried vegetable material, such as hay or straw into a plastic foil, said vegetable material being supplied in compressed bales, which are separated into loose material which is compressed subsequently.

In a known method of this type, for example hay is supplied in large bales which are loosened and untangled by

means of rolls including one or more pins. Subsequently a supply belt moves small pickings of hay into a buffer chamber where they are weighed. If the required amount of material is present, for example 1.25 or 5 kg, the supply belt is stopped and the material contained in the buffer chamber is moved into a pressing chamber and is compressed into a bale and then packaged in a plastic bag.

This prior art method has as disadvantage that the materials should first be untangled during which it obtains a density of for example 8 kg/m^3 and than after weighing it is compressed again. During compression of for example 1 kg of hay, a hay volume of 0.125 m^3 is reduced to for example 0.011 m^3. Hence a lot of air is pressed away therewith which leads to a lot of dust flying away. Also the compression speed and hence the capacity of the apparatus is reduced thereby. The method also causes small material to be packed into the plastic bag which leads to undesirable nuisance for the user.

The object of the invention is to remove the above disadvantages and for this purpose, before the compression, the material is pre-compacted, and during pre-compacting, the fibres of the material are moved with respect to each other, while they are displaced over a plate having slots.

By compacting the material first, which can be done without compression load, the majority of air is removed therefrom and the subsequent compressing operation into a bale may be performed with great speed. By simultaneously leading the material over a grating and moving the fibres with respect to each other, dust and the like drop out of the apparatus and into a recepticle, for example, and is not packaged.

According to a further improved method, the pre-compacted fibres are compressed by moving pressing walls towards each other perpendicular to the longitudinal direction of the compacting channel.

This feature results in a compressed bale having a structure with folded layers and a more or less smooth outer

side in which the compression pressure is directed outwardly causing the plastic foil to become taut which lends the required stability to the bale.

According to an embodiment of the method according to the invention during the pressing operation the distance between opposite walls of the pressing chamber are reduced to less than half.

This leads to a high density of the material allowing the material to expand back against the wrapping after compression.

According to a further improvement the pressing walls are moved subsequently into perpendicular directions and the fibres are cut in a direction corresponding to one of the pressing directions.

Hereby the material is partly enclosed by the knives during compression which enhances the stability and the firmness of the bales.

In accordance with a further improvement a discharge opening between the compacting channel and the pressing chamber is enlarged or reduced by a control connected to a weighing device such that the weight of the packaged fibres as measured after the pressing chamber remain constant.

This leads to a constant weight of the bales in a simple manner.

The invention also includes an apparatus for performing a method according to the invention.

The invention will be explained in the following description of an exemplary embodiment with reference to a drawing in which:

Fig. 1a shows the feed according to the invention;

Fig. 1b shows the structure of the material according to the invention at the position of the cutting face;

Fig. 2 is a schematic sectional view of a part of an exemplary embodiment according to the invention;

Fig. 3 is the schematic sectional view III-III of fig. 2;

Fig. 4 is a schematic plan view of the apparatus of fig. 2;

Fig. 5 is the schematic sectional view V-V of fig. 4 in the situation that the material is pushed out of the pressing chamber after compression.

In the various figures like parts are indicated with like reference numerals.

Fig. 1a shows a hay bale 1, in which the hay is packaged in a transparent plastic foil (not shown). Inwardly of the foil, the hay is divided into four portions which are separated by a separation face 3. The size of the bale 1 is 30 cm x 17 cm x 7.5 cm and the weight of the bale is approximately 1 kg. The hay consists of long fibre vegetable material which is packaged in its natural manifestation.

At the position of the cutting face of bale 1 shown in fig. 1b, it is clearly visible how the fibrous material is formed under influence of the compression, in which the fibres lie in folds p within the bale 1 and resiliently expand against a wrapping n which is formed of two strips of plastic foil which are interconnected at a seam s.

Fig. 2 and 3 show a part of the apparatus with which the hay bale 1 can be compressed. A conveyor supplies loose pickings of hay in a direction A into a supply opening 4. A pressing device 8 transports the material into a pressing channel 6 to a discharge opening 7 wherein the material is pre-compacted. The pressing channel 6 includes a bottom 12, side walls 11 and a top wall 13. The top wall 13 is moveably connected to a frame (not shown) by means of supports 14, 15 and may be moved relative to the frame through an adjustment device 16. A flap 17 is attached to the top wall 13 on the side of the discharge opening 17, said flap being adjustable relative to the top wall 13 by means of an adjusting device 18. A plurality of fixed pins 19 is mounted into the top wall 13. The bottom 12 comprises a plurality of openings 21.

The pressing device 8 includes a plurality of pressing pins 10 mounted into a beam 9, said pressing pins 10 being able to move through a slot in the top wall 13. A displacement mechanism, constructed in a known way and consisting among others of two levers 20 rotating in direction B, move pressing pin 10 in a direction C when they are in the pressing channel 6.

The operation of the apparatus is as follows: the material supplied by the conveyor belt 5 in the form of loose pickings drops into the supply opening 4 and onto the bottom 12 and is conveyed in direction C by the pressing pins 10. The material is pressed against the material which is already present in the pressing channel 6, so that the loose pickings of material are compressed or compacted. This compacting action can be influenced by changing the cross-sectional area of the pressing channel by adjusting the height of the upper wall 13 or by placing it in a slight funnel shape so that the pressing channel 6 is narrowed in direction C. The cross-section of the pressing channel 6 may also be varied at the position of the discharge opening 7 by means of the flap 17. Good results are obtained by pre-compacting the material to approximately 30 kg/m^3.

When material is pushed forward by the pressing pins 10, a part of the material is retained by the fixed pins 19. As a result of this, the fibres move with respect to each other through a substantial length of the pressing channel, preferably more than one or two times the width thereof which causes small parts in the material, such as dust and grit which is present between the fibres, to drop to the bottom. These small parts, which could cause an undesired mess during feeding of the domestic animals, slide forwardly over the bottom 12 when it is advanced through the pressing channel 6 and drop through the openings 21 provided therein and do not arrive in the bale. Preferably, the openings 21 have long slits which may extend perpendicular to or lengthwise of the channel. Since the openings 21 are long, short fibres do not get stucked therein. The openings

21 may also be provided with guide strips preventing the fibres from getting stuck in the openings and allowing dust to drop down easily. Preferably the fixed pins 19 are placed in the upper part of the pressing channel 6 so that there the most strong mutual movement of the fibres may take place.

Fig. 4 shows the top view of the apparatus with the supply opening 4 and the pressing channel 6, which is attached to and connected through the discharge opening 7 to a compression chamber 23 in which a four-part push out stamp 26 is permitted to move in a direction D. The push out stamp 26 is arranged to push out a compressed bale out of the compression chamber 23 to a position under a stamp 27.

Figs. 5 and 6 show the sectional view V-V of fig. 4 through the compression chamber 23. The upper side of the compression chamber 23 is formed by a stamp 24 to which a separation knife 22 and three knives 25 are fixed. The separation knife 22 is permitted to close the discharge opening 27 of the pressing channel 26 and then simultaneously forms a part of the wall of the compression chamber 23. Another part of the wall on the vertical side of the compression chamber 23 is formed by the four-part push out stamp 26. On the other vertical side the stamp 27 forms a part of the wall at the position of an opening 30.

When the stamp 24 together with the separation knife 22, the push out stamp 26 and the stamp 27 are in the position shown in Fig. 5, the pre-compacted material may be transferred from the pressing channel 6 to the compression chamber 23. After the compression chamber 23 is filled sufficiently the stamp 24 together with the separation knife 22 is moved in direction E and consequently closes the discharge opening 7. At the same time the material is compressed and cut by the knives 25. Subsequently, the push out stamp 26 is moved in direction D halfway the compression chamber 23. The material has then obtained approximately the desired density.

The largest dimension of the compression chamber 23 in which bales of 1 kg are compressed is approximately 30 cm and this is similar to the length of the fibres which is 30 to 50 cm with hay and straw in its natural form. In most cases a plurality of these fibres will come to lie in the whole room of the compression chamber 23 and if there would be no knifes 25 it would be very hard to pull a fibre out of the compressed bale. By providing cutting faces 3 in the bale (see Fig. 1) by the knives 25 the user can easily pull a small amount of material out of the bale during use.

Fig. 6 shows how the compressed material is pushed out of the compression chamber 23 and is wrapped by a plastic foil 33. The stamp 27 is moved in a direction opposite to E, causing the opening 30 to open. The push out stamp 26 pushes the compressed material into a chamber 32 and then the stamp 27 pushes it through an opening 31 and places it in a channel 28.

After the material has arrived in channel 28, a stamp 29 pushes the material in a direction F through channel 28 against a wall 35. There, foil 33 is brought around the material in a known and not further elucidated manner. After the foil 33 has been wrapped, the bale is positioned on a rollway (not shown). A part of the rollway is constructed as a weighing machine and is connected to a control (not shown) which also controls the adjustment devices 16 and 18 described above (see Fig. 2). The weighing machine determines the weight of the compressed material and if necessary the positions of the upper wall 13 and the flap 17 are adjusted, so that the material brought into the pressing chamber 23 has the desired density. Since the dimensions of the pressing chambers 23 do not change, a constant density leads to the desired constant weight for all bales.

The various stamps and the compression chamber are dimensioned such that the material temporarily receives a higher density during compression and cutting. After the material is moved out of the compression chamber it is

allowed to expand slightly in which it keeps a density which is higher than 150 kg/m^3 and preferably higher than 200 kg/m^3. For this purpose the stamp 24 is moved downwardly to such an extent that the material has a height of 5 cm in direction E. Due to the resiliency of the material it may expand again in the channel 28 and also after wrapping it with foil 33 to a desired height of approximately 7.5 cm.

Besides the embodiment described above various variances in the design are conceivable. If for example the compression chamber 23 has a sufficient length in a direction parallel to the pressing channel 6 to produce three bales, the material, after being pushed out of the compression chamber 23 is divided into three parts which are each packaged separately. Each bale may for example contain again three cutting faces so that it is easy to take four portions from each bale in a simple manner. In this embodiment, the stamp 24 comprises eleven knives 25 and a separation knive 22 and the push out stamp 26 consists of twelve parts.

Another variant relates to the position and the construction of the knives 25. In the exemplary embodiment described above the knives are fixed to the lower side of the stamp 24. However, there are fibrous materials which can only be cut after they are compressed to a high density. In that case, the material is compressed first to this density by the stamp 24 and the push out stamp 26 and is then cut by knives which are mounted on the stamp 24 and which are moveable separately and may cut the compressed material through slits present in the stamp 24.

CLAIMS

1. Feed for domestic animals consisting among others of vegetable materials such as hay or straw, dried and compressed and packaged by a wrapping into a bale, characterised in that the bale includes several cutting faces perpendicular to the longitudinal direction, whereas the fibres are compressed parallel to the cutting faces.

2. Feed according to claim 1, characterised in that the wrapping is a closed plastic foil against which the fibres are resiliently expanded.

3. Feed according to claim 1 or 2, characterised in that the distance between the cutting faces is substantially 10 cm.

4. Feed according to claim 2 or 3, characterised in that the vegetable material is stripped of small broken and/or crushed fibre material and other pollutions.

5. Feed according to one of the preceding claims, characterised in that the fibres are compressed to a density which is higher than 150 kg/m^3.

6. Method of packaging a feed for domestic animals consisting of dried vegetable material, such as hay or straw into a plastic foil, said vegetable material being supplied in compressed bales, which are separated into loose material which is compressed subsequently, characterised in that, before the compression, the material is pre-compacted during pre-compacting, the fibres of the material being moved with respect to each other, while they are displaced over a plate having slots.

7. Method according to claim 6, characterised in that the pre-compacted fibres are compressed by moving pressing walls towards each other, perpendicular to the longitudinal direction of the compacting channel.

8. Method according to claim 6, characterised in that during the pressing operation the distance between opposite walls of the compression chamber are reduced to less than half .

9. Method according to one of claims 6-8, characterised in that the pressing walls are moved subsequently into perpendicular directions and the fibres are cut in a direction corresponding to one of the pressing directions.

10. Method according to one of claims 6-9, characterised in that a discharge opening between the compacting channel and the compression chamber is enlarged or reduced by a control connected to a weighing device such that the weight of the packaged fibres as measured after the compression chamber remains constant.

11. Apparatus for performing a method according to one of claims 6-11.

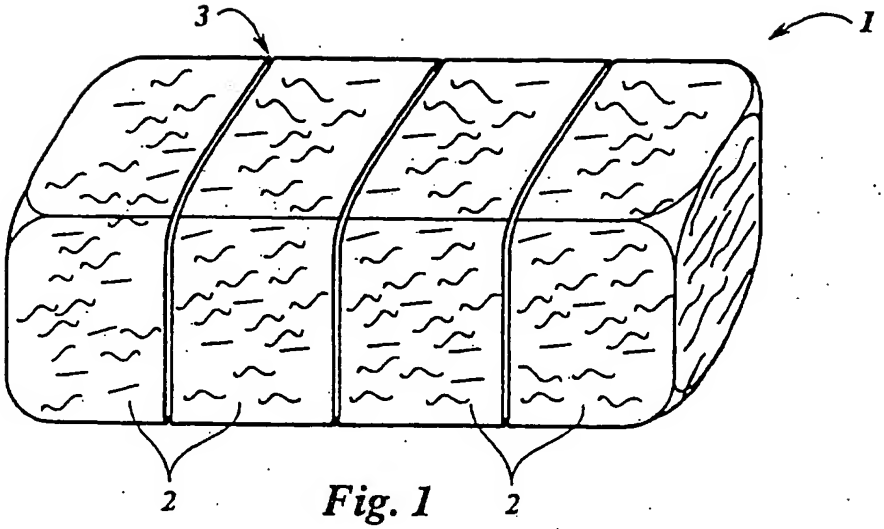


Fig. 1

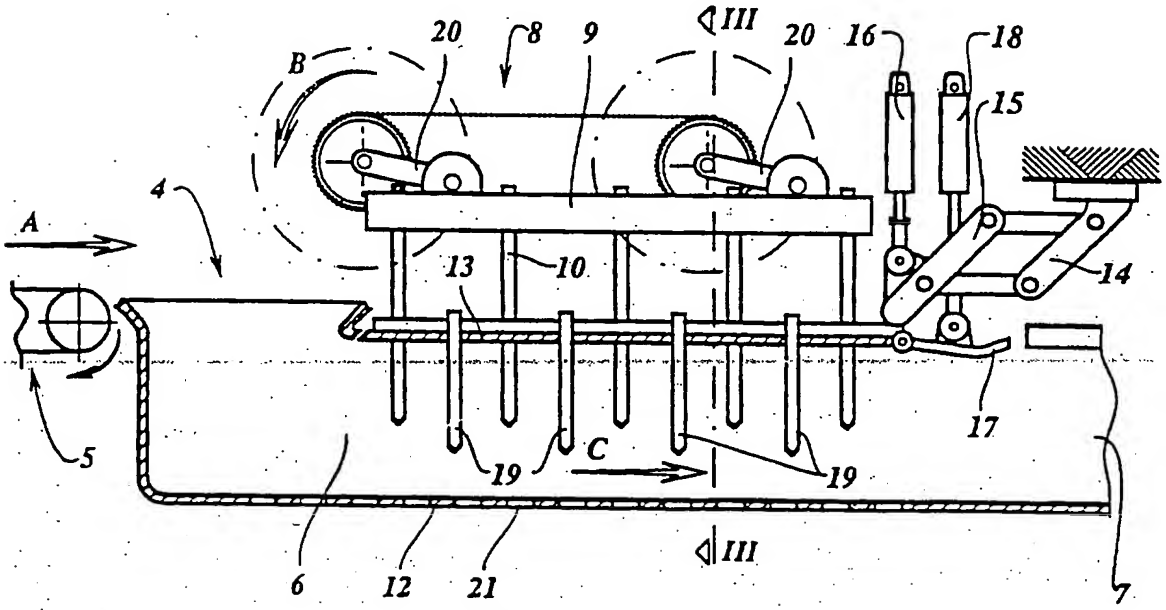


Fig. 2

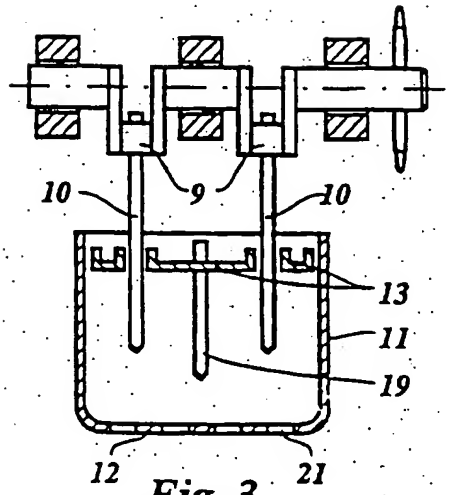


Fig. 3

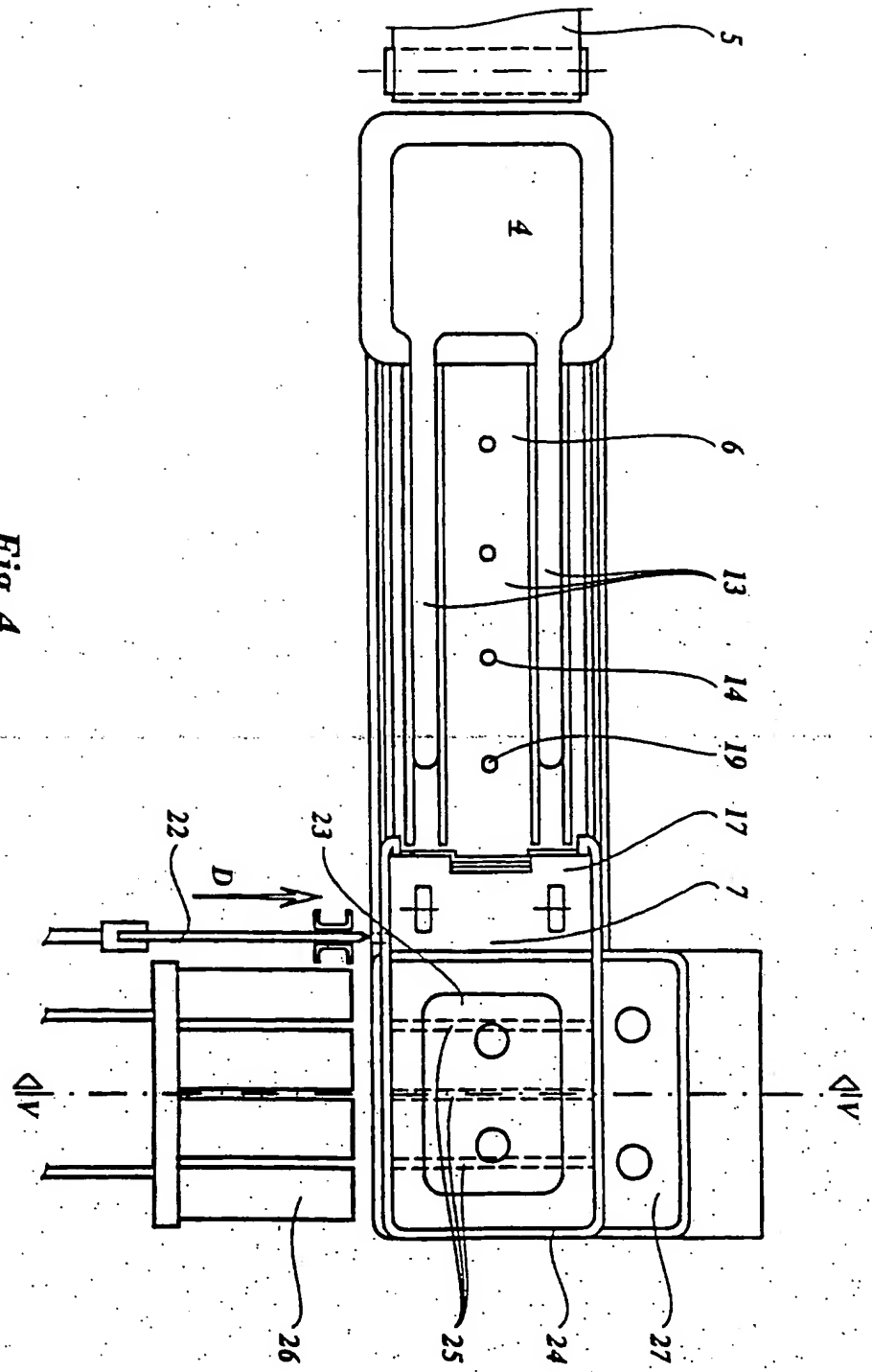


Fig. 4

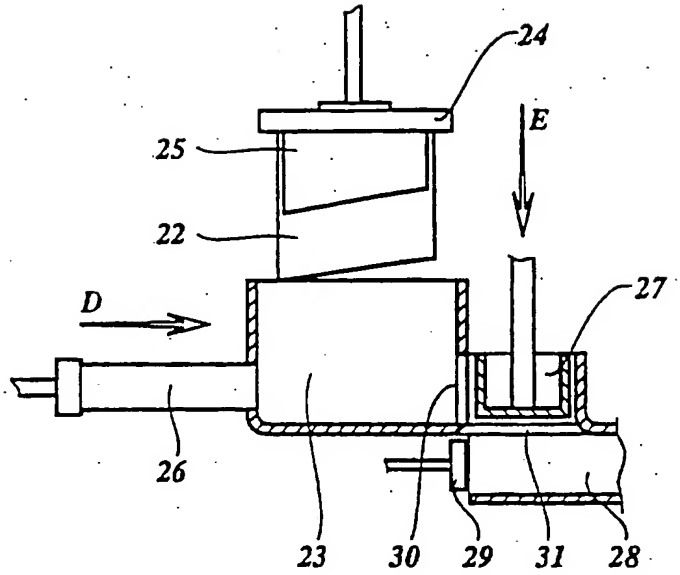

24
E
25
22
D
27
26
23
30
29
31
28

Fig. 5

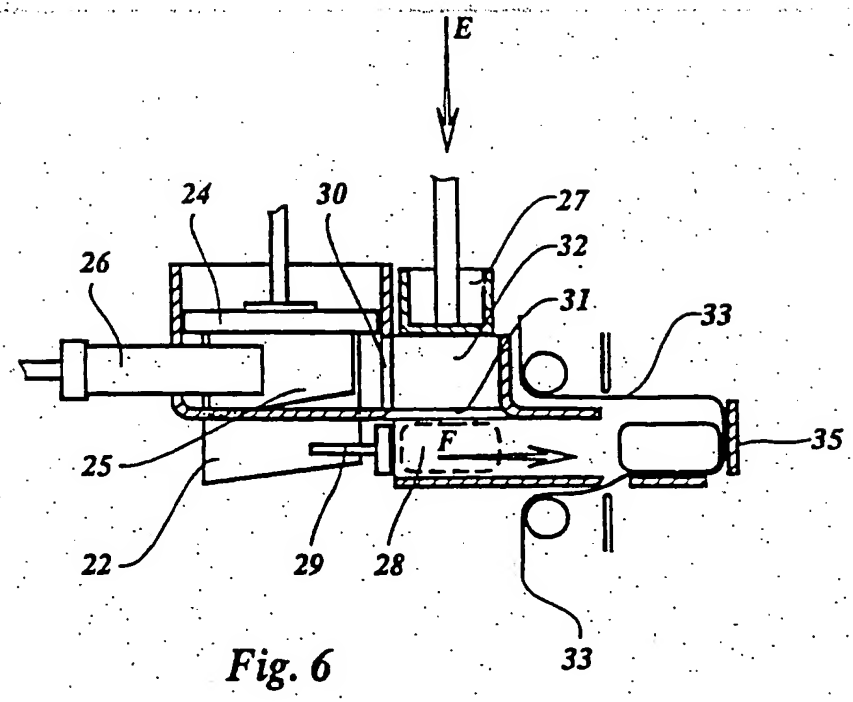

E
24
30
27
32
26
31
33
25
F
35
22
29
28
33

Fig. 6

INTERNATIONAL SEARCH REPORT

Int ional Application No
PCT/NL 96/00372

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B30B9/30 A01F15/00 A01F25/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B30B A01F A01K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE,A,40 36 211 (BAUER) 21 May 1992 see column 2, line 8 - line 42; figures 1-4	1
A	US,A,2 455 442 (ROBINSON) 7 December 1948 see the whole document	4,6
A	EP,A,0 027 824 (OSATO) 6 May 1981 see page 4, line 26 - page 12, line 5; figures 1-7	1,5,6
A	WO,A,88 03114 (WESTAWAY) 5 May 1988 see page 10 - page 16; figures 1-3C	1,2,5
A	FR,A,2 386 980 (GOALABRE) 10 November 1978 see the whole document	1,4,6

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 December 1996	27. 12. 96

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl, Fax (+ 31-70) 340-3016	Vermander, R

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
DE-A-4036211	21-05-92	NONE		
US-A-2455442	07-12-48	NONE		
EP-A-27824	06-05-81	JP-C-	1437296	25-04-88
		JP-A-	56113226	07-09-81
		JP-B-	62035752	04-08-87
		JP-C-	1437283	25-04-88
		JP-A-	55144857	12-11-80
		JP-B-	62035731	04-08-87
		AU-A-	5985280	20-11-80
		WO-A-	8002362	13-11-80
WO-A-8803114	05-05-88	AU-A-	8108087	25-05-88
		DE-A-	3779323	25-06-92
		EP-A-	0330660	06-09-89
		US-A-	5088271	18-02-92
FR-A-2386980	10-11-78	NONE		